REMARKS

The Office has maintained the rejection of the claims of the present application under 35 U.S.C. § 103(a) as being unpatentable over WO 01/31720 in view of Odaohhara et al., U.S. Patent Application Publication No. 2002/0144160 ("Odaohhara") that was made in he first Office Action dated April 14, 2008.

In the response filed August 14, 2008, to this rejection in the first Office Action applicants argued that the recitation in claim 1 of:

> "charging and discharging the battery within a range of state of charge (SOC) where no peak corresponding to a compound of silicon and lithium is observed in an X-ray diffraction pattern of the negative electrode during charging using CuK_{α}-radiation as the X-ray source"

means that the battery is charged to a certain percentage less than 100% of its capacity and is then discharged by 100%. As support for this argument applicants explained that the terminology "State of Charge" is defined as the available, or remaining, capacity of the battery expressed as a percentage of its rated, or nominal, capacity (citing U.S. Patent No. 6,300,763, Cols. 1 and 2, and www.mpoweruk.com/soc.htm).

However, the Office takes the position in the Final action

that the language in claim 1 does not support this argument, i.e., the Office takes the position that claim 1 does not require such an interpretation. The office refers to the recitation in claim 1 of discharging the battery and notes that "in applicants cycle test disclosed in the instant specification the battery is being charged up to 100% (see paragraph [0033] 'capacity is 100% when charge is completed')". The office states that claim 1 can be interpreted as reading on partially discharging the battery before charging. (See page 4 of the Final Action, lines 3-4 from the bottom of the page).

Applicants have amended claim 1 to recite the method of the invention in terms of a method of "improving the cycle characteristics" of a lithium secondary battery comprising "charging" the battery within a range of state of charge (SOC) where no peak corresponding to a compound of silicon and lithium is observed in an X-ray diffraction pattern of the negative electrode during charging using CuK_{α}-radiation as the X-ray source.

Claim 1 as amended is believed to avoid the interpretation given to the claim by the Office in the Final Action.

That the state of charge where no peak corresponding to a compound of silicon and lithium is observed in an X-ray diffraction pattern of the negative electrode during charging using CuK_{α}-radiation as the X-ray source means that the battery is charged to

a certain percentage less than 100% of its capacity is supported by the description in paragraph [0027] and the description and data of Table 1 and Fig. 1 of the present application.

Paragraph [0027] describes providing the characteristic that no peak corresponding to a compound of silicon and lithium is observed in an X-ray diffraction pattern of the negative electrode during charging using CuK_{α}-radiation as the X-ray source by combining the lithium secondary battery of the present invention with a battery charger "which controls a charge ending voltage of the battery to that which limits charging to within a range of state of charge (SOC) where no peak corresponding to a compound of silicon and lithium is observed in an X-ray diffraction pattern of the negative electrode during charging using CuK_{α}-radiation as the X-ray source". A battery charger which limits charging is not required if the battery is charged to 100% of its capacity.

The description of Table 1 in paragraph [0033] describes that the state of charge was calculated "such that capacity is 100 % when charge is completed to 0.00 V (vs. Li/Li^+) at the conditions described above". (Emphasis applicants'). Table 1 shows that for Samples ②, ③ and ④ the potential at end of charge was greater than 0.00 V (vs. Li/Li^+), i.e., capacity was less than 100 %. Only Sample ⑤ was charged to 0.00 V (vs. Li/Li^+).

Fig. 1 and the description of Table 1 and Fig. 1 in paragraph [0037] show that for Samples ②, ③ and ④ there are no clear peaks corresponding to a crystalline structure in a range of 18 ~ 28° in the X-ray diffraction pattern.

It is also noted that in Table 1 "Capacity Retention Rate on the 18th Cycle" is not capacity at the end of charge. Capacity Retention Rate on the 18th Cycle is defined in paragraph [0033] as "Discharge capacity on the 18th Cycle/Discharge capacity on the 1st Cycle."

It is clear from the specification disclosure, therefore, that in the method of the present invention for improving the cycle characteristics of a lithium secondary battery, charging the battery within a range of state of charge (SOC) where no peak corresponding to a compound of silicon and lithium is observed in an X-ray diffraction pattern of the negative electrode during charging using CuK_{α}-radiation as the X-ray source is charging to a certain percentage less than 100% of the capacity of the battery.

In Odaohhara, on the other hand, as noted in the Action of April 14, 2008, a battery is charged by 100% and is then discharged to a certain percentage less than 100%. Therefore, applying the method of Odaohhara to the battery of Fujimoto will not result in the method of the present invention.

Removal of the 35 U.S.C. § 103(a) rejection of the claims is believed to be in order and is respectfully requested.

The foregoing is believed to be a complete and proper response to the Office Action dated February 13, 2009, and is believed to place this application in condition for allowance. If, however, minor issues remain that can be resolved by means of a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number indicated below.

In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension may be charged to our Deposit Account No. 111833.

In the event any additional fees are required, please also charge our Deposit Account No. 111833.

Respectfully submitted,

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